

Preface

Existing construction structures have always been a topic of concern for owners, stakeholders, technicians and researchers, though for different interests and motivations. Apart from other reasons such as aesthetics, socio-economic and cultural values, the role of load-bearing structures in any existing construction probably is, or should be, the major issue when dealing with conservation, preservation and/or rehabilitation of all types of built heritage.

Quite often, conservation and preservation of existing constructions may not be likely to require strengthening or retrofitting of their structures, thus keeping the intervention at the maintenance level. However, when structural repair or rehabilitation is imposed, either due to any kind of external occurrence causing damage or required by modifications of construction configuration or usage, structural retrofitting and/or strengthening might be unavoidable.

Clearly, this issue is extremely wide, in the sense that structural interventions in existing constructions are very much dependent on a large number of different conditions and factors. Of course, the motivation for such interventions has to be first referred since it is likely to influence all the subsequent process and options: for instance, structural strengthening due to load increase resulting from construction usage modifications can lead to interventions very different than those required to make it prepared to withstand relevant seismic demands. Also, different types of constructions, e.g. buildings or bridges, will require different approaches for structural strengthening or retrofitting, despite similar technologies might be adoptable and, obviously, the main constructive materials will be determinant for the type of intervention. Furthermore, the structural safety format framework for existing structures is still an open and non-consensual issue, requiring particular attention for its crucial importance in current design practice; in fact, it is not uncommon that designing strengthening solutions for existing structures to comply with code standards developed for the design of new structures might become practically and/or economically unfeasible. Last but not least, often different types

of strengthening technique solutions can be proposed for a given case under analysis, for which the designer can be faced with difficulties on performing their evaluation in order to make a rationally sustained option.

Considering the above mentioned, the reader immediately realizes the challenge of organizing a book addressing the wide-spectrum topic of strengthening and retrofitting of existing structures. Amongst a few options for the book organization, the editors finally considered that, possibly, the most logical and clear one would involve a first level of book division according to the type of structures, namely buildings and bridges, followed by a second level of chapter sequence related with the structural material.

According to this option, the book first provides a general overview of the motivations, concepts and approaches for structural strengthening and retrofit, which constitutes the introductory chapter. Subsequently, due to their particular importance and peculiarities, historical buildings and cultural heritage monuments are focused in what concerns conservation issues and structural interventions, as addressed in the second chapter. The book then includes six chapters, which go into detail on strengthening and retrofitting options, solutions and techniques, according to the type of construction material, namely stone and brick masonry, adobe, timber and reinforced concrete, the latter more thoroughly addressed depending also on the strengthening material, consistently with its widespread use and importance in current construction from early-mid twentieth century. As for bridges, the book includes three chapters, focusing the strengthening of reinforced concrete, masonry and steel bridges. As a common issue to buildings and bridges, ground and foundation systems are also addressed, concerning their reinforcement and rehabilitation, in a specific chapter. Two final chapters are included, one presenting and discussing the safety assessment of existing structures, particularly under seismic action given its importance and specific issues, while the other addresses tools to prioritize possible strengthening techniques.

It is worth noting that, within the particular case of seismic rehabilitation, the solutions based on seismic isolation concepts are presently well established resorting to appropriate devices developed for practical applications. Although this could suggest having included a chapter fully dedicated to seismic isolation, the editors considered that such an option would have gone beyond the book scope, since it constitutes a quite specific topic, for a particular type of structural loading, which would have required an extensive written piece of text for meaningfulness. Therefore, seismic isolation is considered in the book as a possible and viable option in seismic rehabilitation works, with a few practical application references included in some chapters.

In several chapters, beyond the description of strengthening and retrofitting techniques, examples of application in real case studies are also included, thus providing a more practical view of the proposed solutions.

All in all, it is the editors' conviction that the book provides a broad overview of the solutions' spectrum for strengthening and retrofitting of existing structures,

from simple and well-established procedures to more recent and cutting-edge solutions, giving the reader important information and inspiration for the adoption and implementation of adequate interventions on existing structures, without disregarding the compatibility concerns with the original materials, structural components and systems.

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